

COUNTRY ANALYSIS BRIEFS

Taiwan

Last Updated: September 2006

Background

Located across the Taiwan Strait from mainland China, Taiwan is an important economic and trading center, with one of the busiest ports in the world (Kaohsiung). As Taiwan lacks sufficient domestic energy sources, it is almost totally dependent on energy imports.

Taiwan's economic growth slowed in 2005, with real gross domestic product (GDP) expanding at 4.1 percent, down from the 2004 rate of 6.1 percent. The slowdown was largely due to weakness in the export sector, particularly consumer electronics, and rising oil import costs. Real GDP growth for 2006 is forecast at 3.8 percent.



After coming to power in 2000, Taiwan's President Chen Shui-bian of the Democratic Progressive Party (DPP) became the country's first democratically elected leader that was not from the Kuomintang (KMT) party. Taiwan's citizens reelected President Chen in March 2004 by a slim margin of 0.2 percent. In June 2006, President Chen survived calls for his resignation when an opposition-initiated motion to recall him failed to receive the required two-thirds vote in the legislature to be put to a national referendum.

Taiwan has very limited domestic energy resources and relies on imports for most of its energy requirements. Taiwan has encouraged investment in domestic oil and natural gas projects, including partnerships with mainland Chinese companies. However, these efforts are unlikely to yield sufficient energy resources to reverse the island's import dependence.

Taiwan was admitted to membership in the World Trade Organization (WTO) in November 2001, concurrently with China's admission (please see the [China Country Analysis Brief](#) for more information). Unlike China, Taiwan was admitted to the WTO as a "developed country," which imposes more stringent requirements for reducing barriers to foreign competition. Taiwan recently has lifted some restrictions on direct trade with and investment in mainland China, which is expected to increase cross-strait commercial ties.

Oil

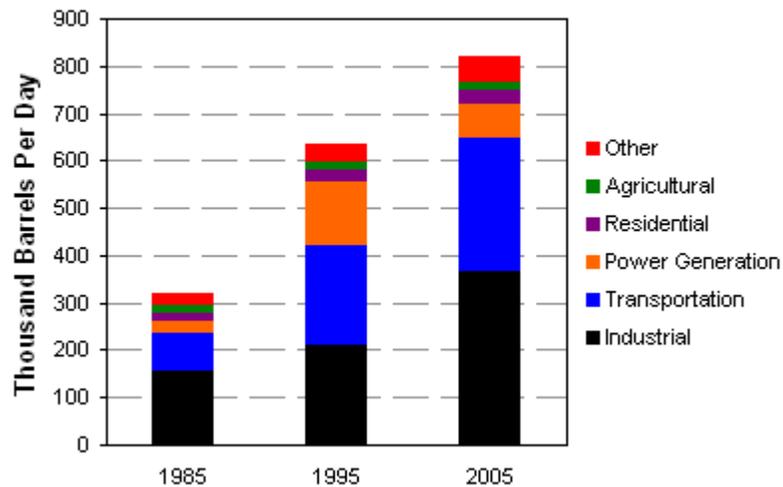
Because of its low domestic oil reserves, Taiwan

According to *Oil and Gas Journal* (OGJ), Taiwan had 2.4 million barrels of proven oil reserves in January 2006. During the first half of 2006, Taiwan produced 7,910 barrels per day (bbl/d) of oil,

meets nearly all of its oil demand through imports.

of which only 800 bbl/d was crude oil. Almost 90 percent of Taiwan's oil production comes in the form of refinery gain, resulting from the country's large petroleum refining sector. EIA forecasts that Taiwan will consume 973,000 bbl/d of oil in 2006, virtually all of which will come from imports.

Taiwan's Oil Consumption by Sector



Source: Taiwan Ministry of Economic Affairs, Bureau of Energy

Sector Organization

Chinese Petroleum Corporation (CPC), Taiwan's national oil company, is the dominant player in all sectors of the country's petroleum industry. However, significant competition began in July 2000 with the opening of a refinery at Mailiao by the privately-owned Formosa Petrochemical Company (FPCC). Taiwan's legislature passed the Petroleum Administration Law in October 2001, which removed CPC's quasi-governmental policy implementation functions, and which will permit the eventual sale of a majority stake in the firm. The government has set forth plans to sell up to a 48 percent stake in CPC. The United Arab Emirates (UAE) state-owned International Petroleum Investment Company (IPIC) reportedly offered more than \$5 billion for a 20 percent share in CPC, however legislative disagreements in Taiwan caused IPIC to put the plan on hold (please see the [UAE Country Analysis Brief](#) for more information). Many analysts expect privatization efforts to proceed in the future when greater political cohesion can be reached.

Exploration and Production

CPC has conducted exploration activities in Taiwan for more than 50 years; however, the country has never had significant domestic oil production assets. Despite the lack of formal ties between Taipei and Beijing, Taiwan and China have developed a cooperative relationship in the field of energy. CPC and Beijing's state-owned China National Offshore Oil Corporation (CNOOC) signed a deal in 1996 to jointly explore a 6,000 square mile area in the Tainan Basin of the Taiwan Strait. Some estimates put recoverable oil reserves in the basin at 300 million barrels, although no production has yet taken place. Although some cross-strait cooperation has taken place between Taiwan and China, numerous territorial disputes in the resource-rich South China Sea persist. Various countries in the Asia-Pacific region lay claim to some portion of the South China Sea, which has limited exploration and production activities in the region (please see the [South China Sea report](#) for more information).

CPC is also active in overseas oil exploration and production projects through its overseas arm the Overseas Petroleum Investment Corporation (OPIC). OPIC currently holds equity stakes in eight overseas oil fields in five countries: Blocks 16 and 17 in Ecuador, the Sanga Sanga Field in Indonesia, the Gulf of Paria East and West fields in Venezuela, the AC/P21 and AC/P32 fields in Australia, and the Andrea Field in the United States (please see the [Ecuador](#), [Indonesia](#), [Venezuela](#), [Australia](#), and [U.S.](#) Country Analysis Briefs for more information). The projects in Ecuador and Indonesia are OPIC's largest, bringing in a combined 5.5 million barrels of crude oil in 2005. In January 2006, the government of Chad awarded a joint oil exploration contract to OPIC for three blocks totaling more than 10,000 square miles in the Lake Chad, South Chari, and West Chari basins (please see the [Chad Country Analysis Brief](#) for more information). After

reaching the agreement, the Chadian government suspended diplomatic recognition of Taipei, although CPC officials declared that the move would not affect OPIC's contract. CPC anticipates that the three blocks will eventually yield 180,000 bbl/d of crude oil, of which 70 percent would go to Taiwan.

Downstream Activities

Prior to the construction of Formosa Petrochemical Company's Mailiao refinery, Taiwan imported a significant quantity of refined petroleum products. Today the country's refining capacity exceeds its domestic consumption of petroleum products, making Taiwan a net exporter of products. According to *OGJ*'s January 2006 figures, Taiwan had 1.2 million barrels per day (Mmbbl/d) of refining capacity at four facilities: CPC's Kaohsiung (270,000 bbl/d), Ta-Lin (300,000 bbl/d), and Tau-Yuan (200,000 bbl/d) plants as well as FPCC's Mailiao refinery (450,000 bbl/d). In August 2006, Formosa completed an upgrade at its Mailiao facility, bringing the refinery's capacity to 520,000 bbl/d. Both CPC and FPCC are considering building additional new refineries or expanding upon existing plants.

Petrochemicals

Taiwan has a robust petrochemical sector, which is the result of the country's strong base in petroleum refining. CPC's petrochemical production is based at its Kaohsiung Refinery and the Linyuan Petrochemical Plant. The Linyuan site is independently operated by CPC's Petrochemical Business Division (PBD), which was established in 2000 in response to the opening of downstream activities to enhanced competition. In July 2005, there was an explosion at the No. 3 naphtha cracker in Linyuan, which caused CPC to shut down the facility for several months to make the necessary repairs. CPC is currently renovating and expanding the No. 3 naphtha cracker to increase the efficiency and safety of the system. When completed in 2011, the upgrade will give the naphtha cracker a capacity of 1 million tons per year (Mmt/y) of ethylene, 600,000 t/y of propylene, 170,000 t/y of butadiene, and 120,000 t/y of benzene.

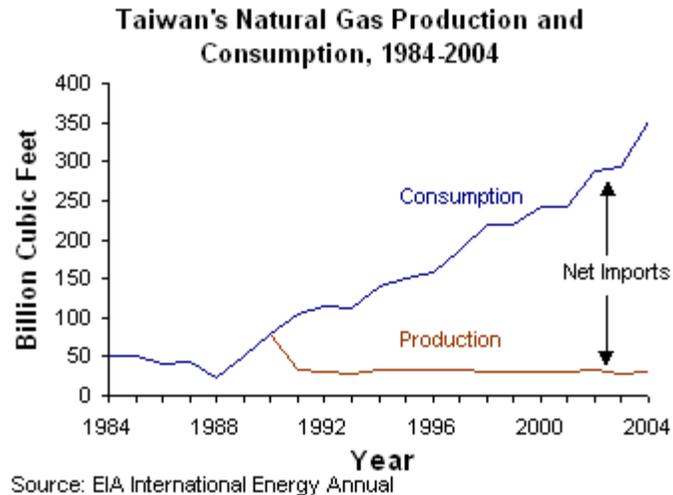
CPC is currently planning a petrochemical technology park to be constructed in the Yunlin Offshore Industrial Zone. The project includes a 300,000 bbl/d refinery, a 1.2 million t/y naphtha cracking complex, 23 petrochemical units, and related transmission and storage units. CPC and several private companies established the Kuokuang Petrochemical Technology Company Ltd. in January 2006 to undertake the project. CPC holds a 43 percent stake in the joint venture project. Construction of the complex is scheduled to begin in 2006, and CPC estimates that the new facilities will begin commercial operations in 2010.

The FPCC Mailiao refining complex also hosts many petrochemical facilities. The company's No. 6 Naphtha Cracker project at Mailiao, which began in 1998, will eventually bring at least 50 medium and large-scale petrochemical facilities onstream. The project currently has two naphtha crackers with a combined ethylene output of 1.85 Mmt/y. Formosa eventually hopes to double its naphtha cracking capacity when the project is complete, although rises in feedstock prices during the last year have slowed project plans.

Natural Gas

As in the petroleum sector, CPC dominates Taiwan's natural activities. Taiwan has very limited domestic natural gas reserves. According to *OGJ*, Taiwan had 297 billion cubic feet (Bcf) of proven natural gas reserves as of January 2006, down from 2.7 trillion cubic feet (Tcf) in 2005. Other sources do not show such a large downgrade in Taiwan's natural gas reserves. Cedigaz estimated that Taiwan held 2.6 Tcf of proven natural gas reserves as of January 2006, only 0.1 Tcf lower than its 2005 figure. In 2004, Taiwan consumed 352 Bcf of natural gas while only producing 30 Bcf. CPC anticipates an increase in natural gas demand due to the construction of additional natural gas-fired power plants and rising liquefied natural gas (LNG) imports.

In 2004, Taiwan was the world's fifth-largest importer of liquefied natural gas.



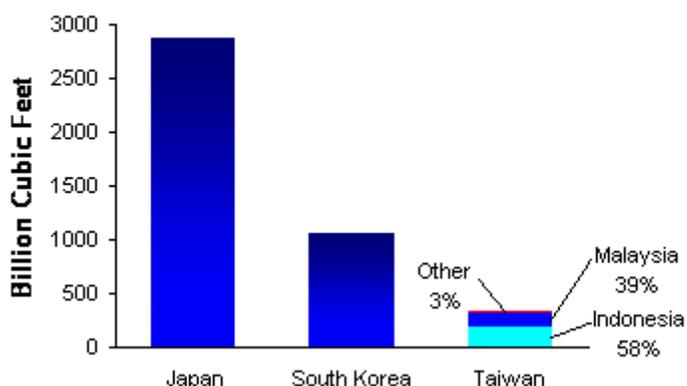
Exploration and Production

Taiwan has nine onshore natural gas producing fields on the western side of the island, as well as three modest offshore platforms in the CBK 1-3 natural gas fields. Despite limited production and discovery of natural gas reserves to date, CPC continues to conduct exploration activities, particularly in offshore areas. During 2005, CPC reported that it discovered 5.4 Bcf of additional proven natural gas reserves in the southeastern section of its Guantian natural gas field. In July 2005, Taiwan's legislature approved a CPC plan to explore and develop the offshore F Structure off Kaohsiung, which the company estimates holds 211 Bcf of natural gas. CPC is also engaged in cross-strait cooperation with China's CNOOC in the Tainan basin in the Taiwan Strait, which CPC estimates to hold 41.7 trillion cubic feet (Tcf) of natural gas reserves. While this could prove to be a sizeable reserve for Taiwan, one industry report states that initial drilling in the Tainan basin did not yield any commercially recoverable natural gas deposits (please see the [natural gas section of the South China Sea report](#) for more information).

Liquefied Natural Gas

Taiwan had net imports of 332 Bcf of liquefied natural gas (LNG) in 2004, up 29 percent from 2003 import levels. Indonesia and Malaysia are Taiwan's primary LNG suppliers, although 2004 data shows that Taiwan also received small amounts of LNG from Nigeria, Oman, and the UAE (please see the [Malaysia](#), [Nigeria](#), and [Oman](#) Country Analysis Briefs for more information). The Taiwanese government hopes to increase the importation of LNG to help meet the country's increasing energy needs and reduce emissions levels. However, concerns have grown over the stability of the Indonesian supply, particularly after Indonesia's Pertamina canceled ten LNG cargoes to Taiwan in late 2004. To help diversify its LNG supply, CPC signed a 25-year LNG purchase agreement with RasGas of Qatar to begin in 2008. In August 2006, Japan's NYK-Mitsui joint venture won a 25-year contract to ship the LNG from Qatar to Taiwan.

LNG Imports in the Asia-Pacific Region, 2004



Source: Cedigaz; IEA *Natural Gas Information 2005*

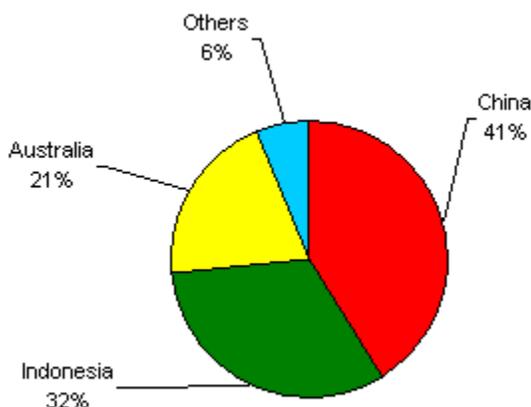
CPC operates Taiwan's only LNG receiving terminal at Yungan township of Kaohsiung, which has a capacity of 7.4 million tons per year (360 Bcf/y of natural gas). CPC is also constructing a new LNG import terminal in Taichung, which is expected to begin operations in early 2008. The project will cost an estimated \$750 million, and will add 3 million tons per year (146 Bcf/y of natural gas) of LNG import capacity. To facilitate supply and expand the use of natural gas in Taiwan, CPC has completed a complete transmission and distribution network along the country's west coast, which includes a 1,100-mile main trunk pipeline and 36 regional distribution stations.

Coal

Taiwan has negligible coal reserves, and imports all of the coal that it consumes.

Taiwan has very limited coal resources, and domestic coal production stopped in 2000. In 2004, Taiwan consumed 62.9 million short tons (Mmst) of coal, up 27 percent since 2000. According to Taiwan's Ministry of Economic Affairs, 77 percent of the coal Taiwan consumes is for power generation purposes. Taiwan meets all of its current coal consumption with imports, primarily from Indonesia, Australia, and China.

Taiwan's Coal Imports by Source, 2004



Source: Taiwan Ministry of Economic Affairs, Bureau of Energy

Electricity

In the mid-1980s, nuclear power represented nearly half of the electricity generated in Taiwan. In 2004, however, nuclear power

In 2004, Taiwan had 33.3 gigawatts (GW) of installed generation capacity, from which it generated 173 billion kilowatthours (Bkwh) of electricity. During 2004, 74 percent of Taiwan's electricity generation came from conventional thermal sources, while 22 percent was nuclear and 4 percent hydroelectric. In the mid-1980s, nuclear power comprised roughly half of the total electricity generated in Taiwan. However, the growth of fossil fuel-based power stations has decreased the share of nuclear power in Taiwan's energy mix.

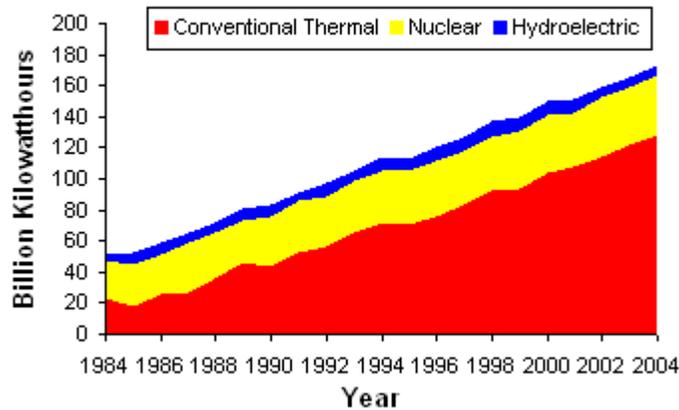
comprised only 22 percent of Taiwan's total electricity generation.

Sector Organization

Taiwan Power Company (Taipower), the state-owned electric power utility, currently dominates Taiwan's electricity sector. Taipower's monopoly status technically ended after 1994, when the Taiwanese government encouraged the formation of independent power producers (IPPs). Today, IPPs own roughly one quarter of Taiwan's generating capacity, although independent producers are required to sign power purchase agreements with Taipower, which maintains a monopoly in transmission and distribution activities. After joining the WTO in 2001-2002, foreign firms were permitted 100 percent ownership of firms in the sector.

The Taiwanese government plans to carry out a full or partial privatization of state-owned Taipower. Under the basic framework envisioned, Taipower would retain a monopoly on transmission and distribution networks, while its generation assets would be split into several firms. Taipower would also retain exclusive control over nuclear and hydropower plants. However, poor financial results over the last several years have delayed plans for privatization until some period in the future. Part of Taipower's poor financial performance stems from a freeze on energy rate hikes that has been in place since 1983. In July 2006, Taipower raised electricity rates for the first time in more than 20 years in an effort to bring prices in Taiwan more in line with international levels.

Taiwan's Electricity Generation by Source, 1984-2004



Source: EIA International Energy Annual

Conventional Thermal

Conventional thermal sources comprise the bulk of Taiwan's installed generating capacity. The fastest growth has been in natural gas-fired electricity generation, owing to government incentives that encourage new projects to use natural gas. The Democratic Progressive Party (DPP) government came into office in early 2000 promising to approve only natural gas-fired power projects in the future, and to increase natural gas' share of Taiwan's power generation to roughly one-third by 2010. Still, natural gas-fired plants only account for about 15 percent of Taiwan's total share. Taipower is currently building a large 4,300-megawatt (MW) natural gas-fired power station at Tatan. When completed in 2008, the facility will be the largest cogeneration plant in the world. The first two of eight generating units began operations at Tatan in mid-2006. The system will initially be powered by diesel, but will switch to natural gas when Qatari LNG shipments to Taiwan begin.

Taiwan's first IPP, the 1,800-MW coal-fired power station at Mailiao owned by Formosa Plastics Group, opened in 1999. Another 1,320-MW coal-fired IPP plant began commercial operations in mid-2002. Other IPP projects that utilize natural gas have been constructed or approved, but several others have been delayed or scrapped altogether because of rising LNG costs and slow Taiwanese government approval of IPP plans.

Nuclear

Taipower operates three nuclear power plants with a total capacity of 4,900 MW. The construction of Taiwan's fourth nuclear plant has been controversial. After coming into office in 2000, President Chen cancelled the construction of the 2,700-MW Kungliao nuclear reactor at Lungmen.

However, in February 2001, the legislature overturned this decision and called for the project to resume. Currently, the Kungliao project is scheduled to start commercial operations at its first unit in 2009, with the entire plant to be completed by 2012. The uncertain future of the fourth nuclear reactor project, which would add a sizeable amount to Taiwan's current generating capacity, has caused hesitation in other power plant construction plans.

Other Sources

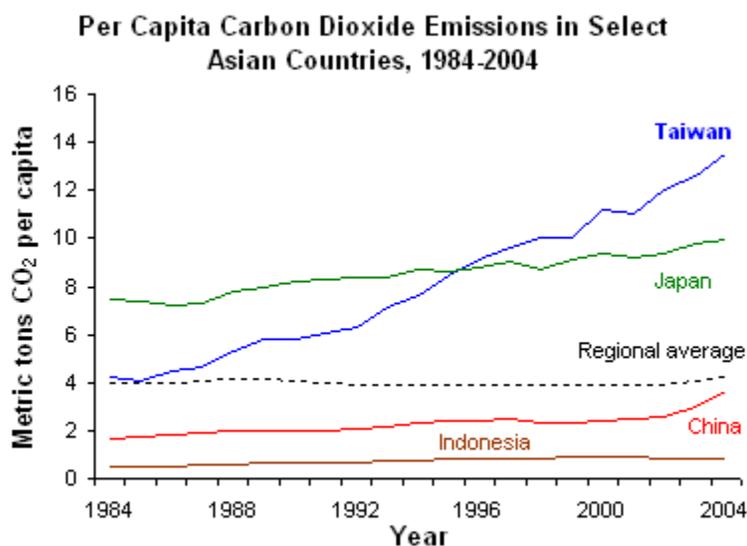
Hydroelectric power accounts for 13.6 percent of installed generating capacity, although in 2004 only 4 percent of Taiwan's total electricity generation came from hydroelectric sources. Several new and ongoing hydroelectric plants are expected to come online in the next few years, including the 210-MW Kukuan Hydroelectric Power Plant Rehabilitation (June 2007), the 60-MW Bihai Power Project (December 2007), and the 75-MW Hsibao Power Project (January 2009).

The government of Taiwan encourages the use of renewable energy sources, including wind power, solar energy, and biomass. It expects these sources to account for 10 percent of the country's generation capacity by 2010, although these sources contributed less than one percent toward Taiwan's electricity generation in 2004.

Environment

Taiwan has one of the highest per capita carbon dioxide emissions levels in the Asia-Pacific region.

Taiwan is grappling with the environmental ramifications of building one of Asia's richest economies through a decades-long commitment to economic growth. Per capita energy use in Taiwan is on par with several of its neighboring countries in Asia. However, energy intensity levels in Taiwan compared to other developed countries tend to be relatively high, owing primarily to the country's heavy concentration of energy-intensive manufacturing industries. Taiwan's per capita carbon dioxide emissions have been increasing, and in 2004 represented more than four and a half times the amount of per capita carbon dioxide emissions in China.



Source: EIA International Energy Annual

Although Taiwan did not sign the Kyoto protocol, the government is working to reduce carbon dioxide emissions. In June 2005, the Ministry of Economic Affairs (MOEA) announced plans to cut carbon dioxide emissions by 170 million metric tons per year by 2025. The MOEA plans to impose restrictions on emissions from Taiwan's top 200 energy consumption enterprises, including the Formosa Plastics Group and the China Petroleum Corporation.

Profile

Country Overview

President	Chen Shui-bian (since May 2000)
Location	Eastern Asia, islands bordering the East China Sea, Philippine Sea, South China Sea, and Taiwan Strait, north of the Philippines, off the southeastern coast of China

Population (2005E)	22,894,384
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Economic Overview

Minister of Economic Affairs	Chen Ruey-Long
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Exchange Rate (August 23, 2006)	1 USD = 32.8 Taiwan New Dollars (TWD)
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Inflation Rate (2005E)	2.3%
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Gross Domestic Product (2005E)	\$346.1 billion
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Real GDP Growth Rate (2005E)	4.1%
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Unemployment Rate (2005E)	4.1%
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External Debt (2005E)	\$87.5 billion
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Exports (2005E)	\$200.0 billion
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Exports - Commodities	computer products and electrical equipment, metals, textiles, plastics and rubber products, chemicals (2002)
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Exports - Partners (2004E)	China, including Hong Kong 37%, US 16%, Japan 7.7%
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Imports (2005E)	\$188.7 billion
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Imports - Commodities	machinery and electrical equipment 44.5%, minerals, precision instruments (2002)
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Imports - Partners (2004E)	Japan 26%, US 13%, China, including Hong Kong 11%, South Korea 6.9%
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Current Account Balance (2005E)	\$18.5 billion
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Energy Overview

Proven Oil Reserves (January 1, 2006E)	2.4 million barrels
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Oil Production (2006E)	8.5 thousand barrels per day, of which 9% was crude oil.
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Oil Consumption (2005E)	992.6 thousand barrels per day
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Crude Oil Distillation Capacity (2006E)	1.22 million barrels per day
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Proven Natural Gas Reserves (January 2006E)	297 billion cubic feet (OGJ); 2.6 trillion cubic feet (Cedigaz)
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Natural Gas Production (2004E)	30 billion cubic feet
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Natural Gas Consumption (2004E)	352.4 billion cubic feet
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Recoverable Coal Reserves (2003E)	1.1 million short tons
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Coal Production (2004E)	None
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Coal Consumption (2004E)	62.9 million short tons
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Electricity Installed Capacity (2004E)	33.3 gigawatts
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Electricity Production (2004E)	173 billion kilowatt hours
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Electricity Consumption (2004E)	160.9 billion kilowatt hours
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Total Energy Consumption (2004E)	4.4 quadrillion Btus*, of which Oil (46%), Coal (35%), Natural Gas (9%), Nuclear (9%), Hydroelectricity (1%), Other Renewables (0%)
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Total Per Capita Energy Consumption (2003E)	184.8 million Btus
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Energy Intensity (2004E)	8,680.1 Btu per \$2000-PPP**
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Environmental Overview

Energy-Related Carbon Dioxide Emissions (2003E)	280.3 million metric tons, of which Coal (49%), Oil (45%), Natural Gas (7%)
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Per-Capita, Energy-Related Carbon Dioxide Emissions (2003E)	12.4 metric tons
Carbon Dioxide Intensity (2004E)	0.6 Metric tons per thousand \$2000-PPP**
Environmental Issues	air pollution; water pollution from industrial emissions, raw sewage; contamination of drinking water supplies; trade in endangered species; low-level radioactive waste disposal

Oil and Gas Industry

Organization	Chinese Petroleum Corporation (CPC) dominates all sectors of the oil and gas industry. Significant competition began in 2000 with the opening of the Mailiao refinery by the privately-owned Formosa Petrochemical Company (FPCC).
Major Oil/Gas Ports	Kaohsiung, Keelung, Hualien, Taichung, Suao
Foreign Company Involvement	BP, ExxonMobil
Major Refineries (capacity, bbl/d)	CPC's Kaohsiung (270,000), Ta-Lin (300,000), and Tau-Yuan (200,000) refineries and FPCC's Mailiao refinery (450,000)

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.
 **GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

Links

U.S. Government

[American Institute in Taiwan](#)
[CIA World Factbook – Taiwan](#)
[U.S. Department of State - Consular Information Sheet - Taiwan](#)
[U.S. Department of State - Taiwan Background Notes](#)

Foreign Government Agencies

[Government Information Office – Taiwan](#)
[Ministry of Economic Affairs \(MOEA\) – Taiwan](#)
[MOEA – Bureau of Energy](#)
[Taipei Economic and Cultural Representative Office \(TECRO\) in the United States](#)

Oil and Natural Gas

[Chinese Petroleum Corporation \(CPC\)](#)
[Formosa Petrochemical Corporation](#)

Electricity

[Taiwan Power Company \(Taipower\)](#)

Sources

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 Economist Intelligence Unit
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 Global Insight Asia Economic Outlook
 International Oil Daily
 Lloyd's List
 Oil & Gas Journal
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 U.S. Energy Information Administration
 U.S. Department of State
 Wall Street Journal
 World Markets Research Center

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